Space Weather Technical Forecast

Issued on Friday 18 October 2024 at 13:03 Local

This technical forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of isolated M-flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low with frequent C-class flares, peaking C6.6 at 17/1427 UTC from AR3860 in the southeast. There are eight sunspot regions currently on the disc, however only AR3856 in the northwest displays any notable complexity with a small delta spot within its intermediaries. AR3852 and AR3854 are now approaching the southwest limb, so difficult to assess. The other region remain small and relatively simple with a number of these showing signs of decline.

No Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: Background slow wind conditions were observed at L1 by ACE and DSCOVR with solar winds 350-400km/s and density around or below average. Interplanetary Magnetic Field (IMF), Bt, was Weak to Moderate between 5-9 nT, with its north-south component, Bz, turbulent, but perhaps favouring a negative orientation (southward) overall. This ranged between +7/-8 nT. Phi angle was generally positive (away from the Sun). Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: High energy proton flux observed by GOES18 was at background. High energy electron flux (greater than 2MeV) observed by GOES16 was Background to Moderate with a diurnal peak of 456 pfu at 17/1635 UTC. The associated 24-hour fluence was below the Active threshold. The 18/0000 UTC observation was 1.34e7 total pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is forecast with a chance of isolated M-class flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Background winds are most likely to persist, however spells of slightly elevated to elevated winds cannot be ruled out due to any interaction with the fast wind from CH80/+, which is likely passing north of Earth during days 1-3 (18-20 Oct). CH82/+ fast winds are then possible late day 4 (21 Oct) or just beyond the forecast period. Mainly Quiet geomagnetic activity is expected, with isolated Unsettled intervals. There is a chance of a spell of Unsettled to Active day 1-3 (18-20 Oct) from any fast wind interaction from CH80/+, and chance of Active to G1 Minor Storm day 4 (21 Oct) from the fast wind of CH82/+.

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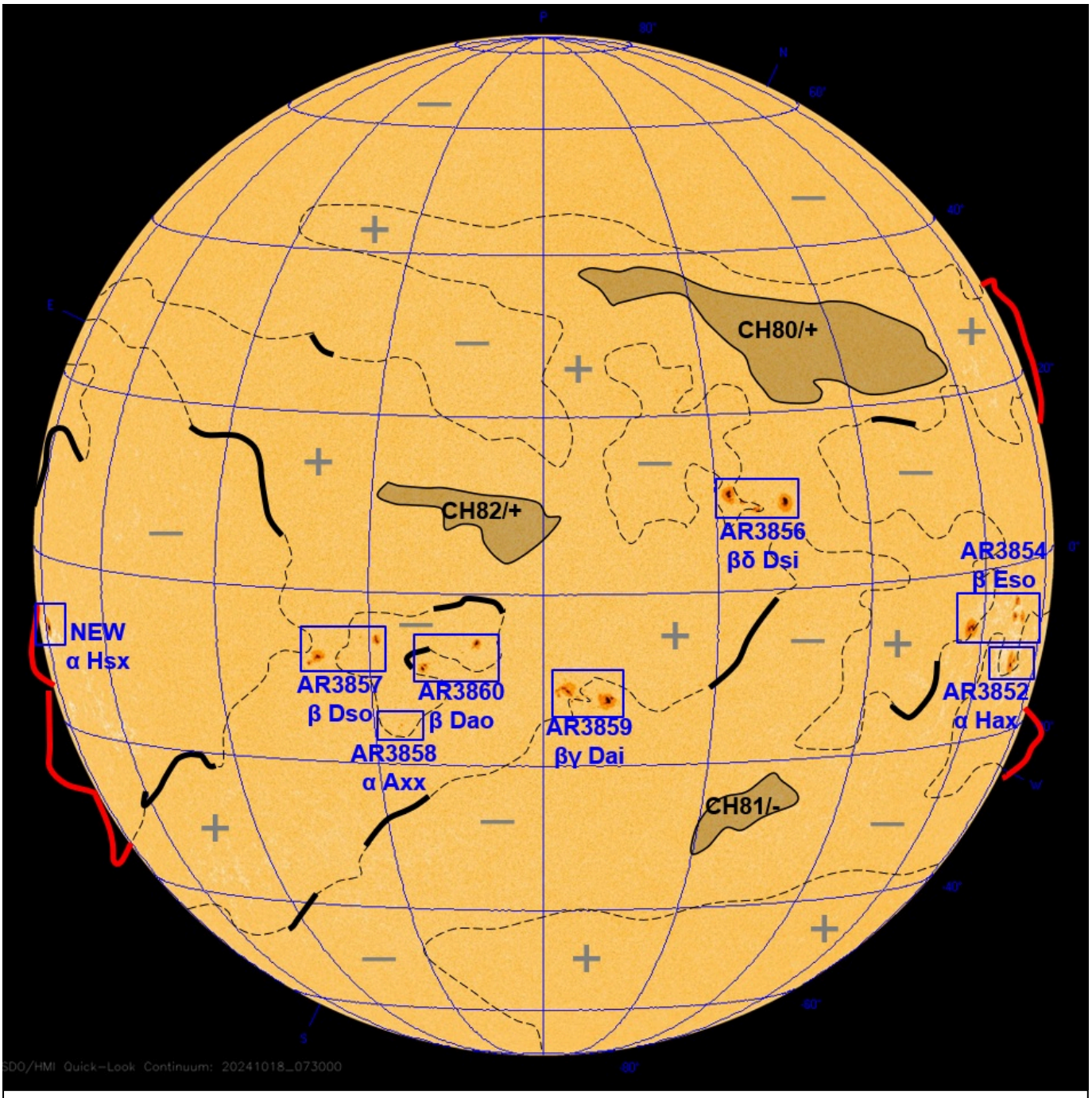
Energetic Particles / Solar Radiation: High energy proton flux at GOES18 is expected to remain at background. High energy electron flux at GOES-16 is forecast to remain Low to Moderate, with a chance of dropping out to more persistently Low given any fast wind onset, most likely day 4 or just beyond the forecast period. The associated 24 hour fluence is expected to remain below Active (1e8 total pfu).

Figure 1: Solar Synoptic Map 18/0800 UTC



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms

There are no Earth-directed CMEs.

Solar winds are currently at background, despite the large coronal hole currently located in the northwest disc. Given Earth's current location north of the elliptic plane, this was expected to give a broad enhancement of elevated winds that have not yet been observed. This now suggests that the core of the fast wind is likely passing north of Earth, however there remains a chance of moving into the southern edge of the winds from this feature for a spell, giving a brief period of slightly elevated to elevated winds of around 450-500km/s through days 1-3 (18-20 Oct). This is supported by MOSWOC Enlil which shows the bulk of the winds from this feature passing north of Earth.

The next enhancement will then be from the onset of fast winds from CH82/+, which has its leading edge currently around the central meridian. This is a smaller, but more equatorial feature, with likely arrival for any CIR region expected to occur late on day 4 or just beyond this period on day 5 (21-22 Oct), with a period of elevated solar winds then expected to follow. This feature currently doesn't feature in Enlil, however on the previous rotation a G1 Minor Storm intervals was observed during the equivalent period.

Geomagnetic activity is forecast to be mainly Quiet with isolated Unsettled intervals. There is a chance of an Unsettled to Active spell given any enhancement from CH80 days 1-3 (18-20 Oct). Fast wind onset from CH82 is expected to bring Active to G1 minor storm intervals, perhaps on day 4, but not occur until late day 5 (21-22 Oct).

Geomagnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	5	10	5	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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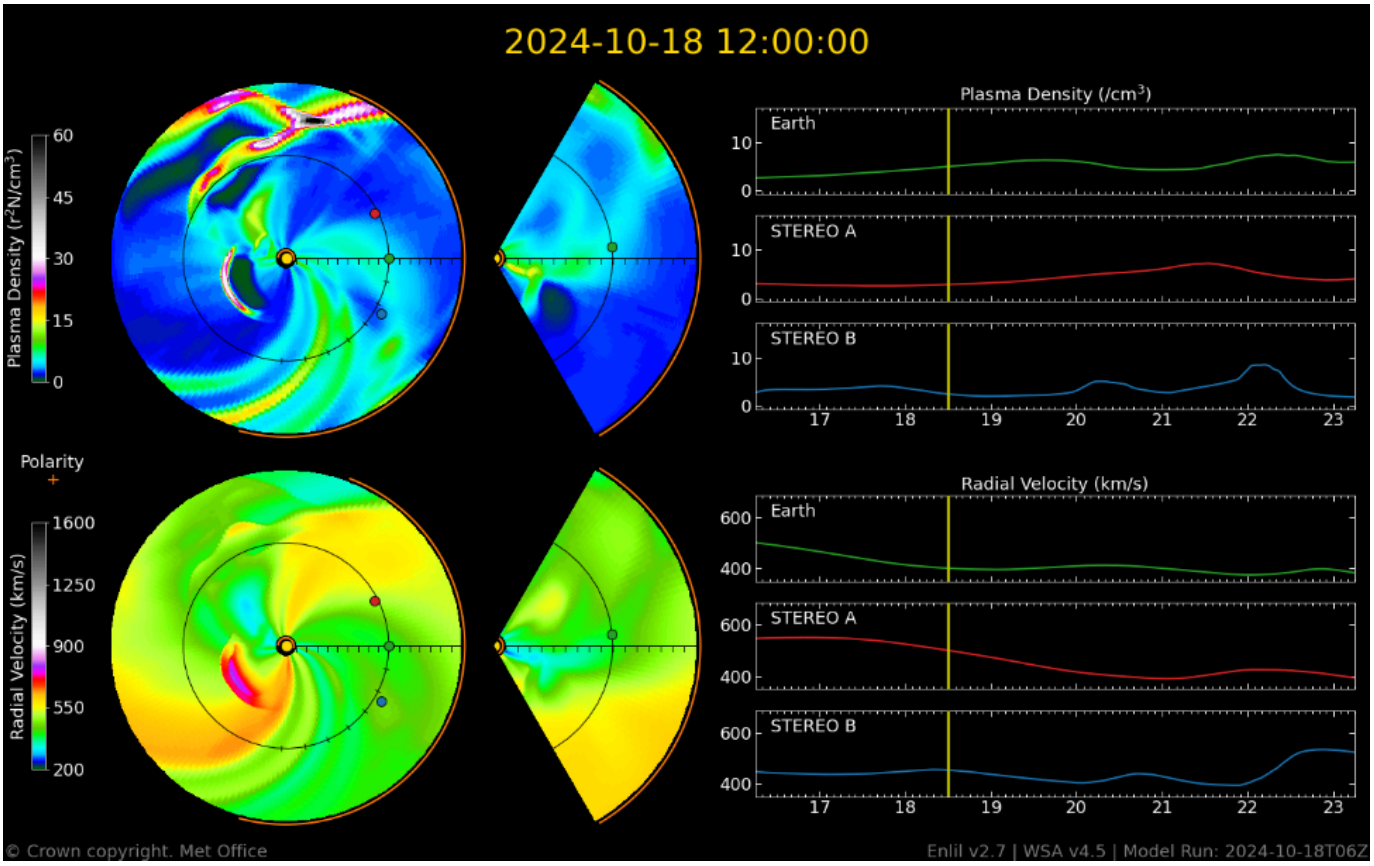
Figure 2: MOSWOC Enlil. HSS can be seen passing north of Earth.



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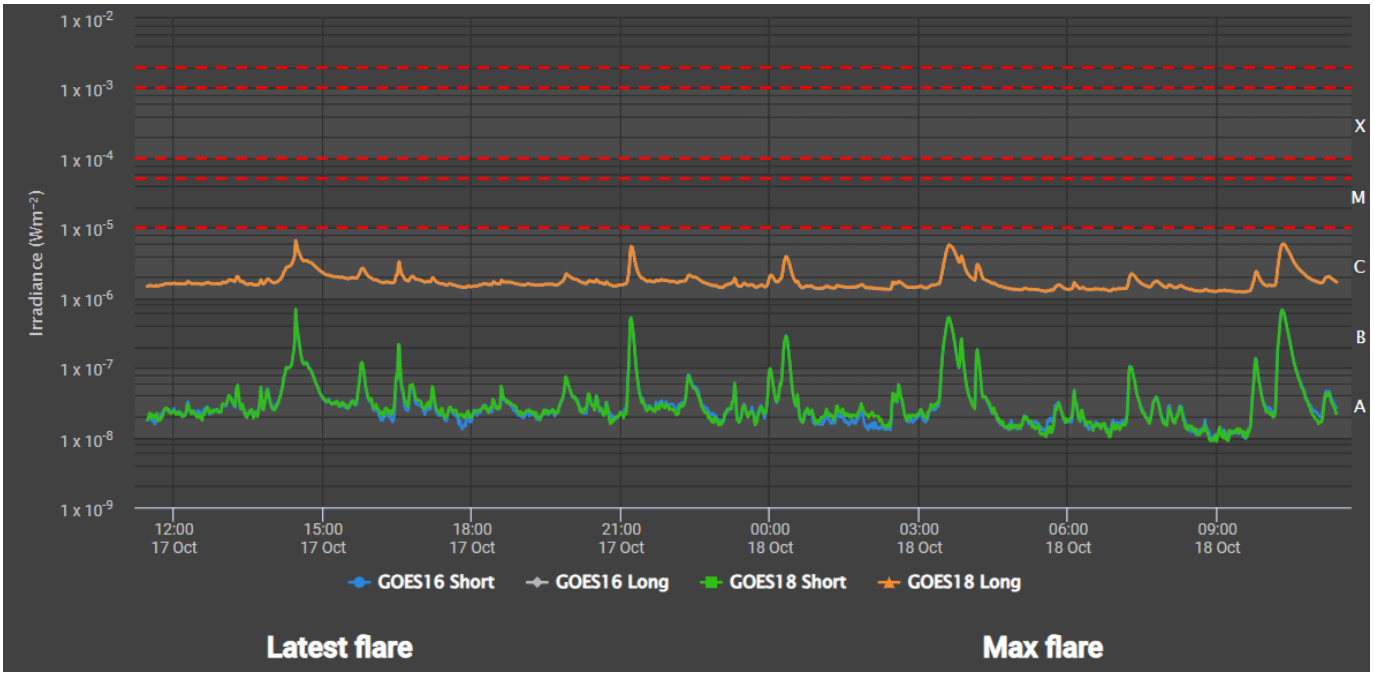
Radio Blackouts - X-Ray Flares

Low to Moderate activity is expected with a chance of isolated M-class flares.

There are eight sunspot containing active regions on the disc. These are all relatively simple bipolar groups, with the main exceptions being AR3856 in the northwest, which maintains a small delta spot within its intermediaries, but has been showing a declining trend, and AR3859 in the south-centre which has shown a recent increasing trend. The other main regions across the south disc, AR3860 and AR3857 are small open regions, while AR3852 and AR3854 are now approaching the west limb and becoming harder to observe, but appear to remain simple and inactive regions. There is one main new region rotating on to the east limb, however this also appears to be a mature and simple region.

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	No	50	60	60	60
Very Active	R3-R5 (X Class)	No	5	5	5	5

Figure 3: GOES-16 and 18 X-ray Irradiance



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Solar Radiation Storms (High Energy Protons)

High energy proton flux at GOES18 is expected to remain at background, with only a very slight chance of enhancement due to any flare activity from any of the active regions currently on the disc, most likely those in the better connected western hemisphere.

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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High Energy Electrons (≥ 2MeV)

High energy electron flux (greater than 2MeV) as observed by GOES-16 have been Background to Moderate. These flux values are expected to continue, perhaps dropping more persistently to background given any solar wind enhancement from the northern coronal hole fast wind on days 1-3 (18-20 Oct), or a more likely solar wind enhancement later on day 4 or just beyond the forecast period on day 5 (21-22 Oct) from the central disc coronal hole CH82.

Overall, fluence is forecast to remain below Active with MOSWOC REFM currently providing good guidance.

GEO Electron Environment Probability (Exceedance)	Level ($cm^{-2}sr^{-1}$ day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ 1×10^{8}**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ 1×10^{9}**	No	1	1	1	1

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Figure 4: GOES-16 Electron Flux for the last 3 days (top) showing diurnal Background to Moderate variation. Associated 24 hr fluence below with MOSWOC REFM giving good guidance

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